Sound Propagation from the Continental Slope to the Continental Shelf: Remote Sensing Component

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LONG TERM GOALS

To use satellite altimetry and AVHRR in conjunction with in-situ measurements to understand the geometry and seasonality of shelf/slope front and the fluctuations of the slope water along the east coast of North America.

OBJECTIVES

We are using TOPEX/Poseidon altimeter data and AVHRR images and to quantify the location, orientation and seasonal variations in the intensity of the shelf/slope front, its spatial extent and coherence, and the frequency and impact of Gulf Stream ring events. The imagery is also used in near real time during at-sea intensive observation periods to give context for surveys and acoustics. The altimeter data is also used to characterize the variations in the region surrounding the intensive observation area. The combination of AVHRR imagery and altimeter measurements will help us determine the spatial extent and coherence of slope circulation fluctuations, and whether these fluctuations propagate along the slope in a predictable fashion.

APPROACH

A comparison between the direct current meter measurements from four current meter moorings, five hydrographic surveys and simultaneous altimeter overflights will determine the mean sea surface height along a single subtrack. We will use the high resolution TOPEX/Poseidon MGDRB data set along with a regional tidal analysis to get subtidal SSH anomalies in the vicinity of the shelf break along several subtracks in the Mid-Atlantic Bight region. The combination of

corrected altimeter data and in-situ measurements be used to get absolute surface velocities for the entire TOPEX/Poseidon mission along the track on which the moorings were located.

Comparisons between the cross-track velocity from the current meters and the geostrophic velocity from the altimeter will help us evaluate the tidal correction.

Having absolute SSH will facilitate the interpretation of SSH observations in terms of shelf/slope front seasonal variations and eddy interactions. The track along which absolute SSH can be estimated will be used as a guide in interpreting SSH anomalies on adjacent tracks.

WORK COMPLETED

We have obtained the most accurate shallow water tidal correction available for the TOPEX/POSEIDON altimeter data. A fine grid version of Professor Christian LeProvost's combined hydrodynamic/empirical tidal model (FES95.2) for the Mid Atlantic Bight area was run for us by the CNRS group at Grenoble, France. Our acquisition of the tidal correction and the software required to implement it was delayed by the move of LeProvost's group from Grenoble to Toulouse, France.

Software to process the altimeter data has been modified to explicitly include the shallow water regions. The tidal correction software is now working and we are applying these corrections to the data in a larger region including the experiment site. The altimeter data will be examined to characterize the seasonal variations of the front, as well as its spatial extent and coherence. We will also be characterizing the impact of Gulf Stream rings and frequency of occurrence, as well as providing a larger-scale context for specific field work.

RESULTS

The AVHRR data has been used to provide large scale context on the complexities of the Shelfbreak current. Altimeter data has been used with the AVHRR to determine ring/front locations and trough/crest curvature. The altimeter results will not be available until the long-term moorings are recovered and processed. We will then be able to determine the accuracy of the altimeter and tidal model in the Shelfbreak current area.

IMPACT/APPLICATIONS

The comparisons between the current meters and the tidally corrected altimeter data will help determine the accuracy and usefulness of altimetric data for shallow water. The comparisons between the shelf/slope front fluctuations in the study area with fluctuations in a larger region will help determine the extent to which results of the overall study apply to the entire Mid-Atlantic Bight, or to other coastal regions.

REFERENCES

http://rsag.whoi.edu/gs.html	Gulf stream seasonal cycle
http://rsag.whoi.edu/avhrr.html	AVHRR images for NW Atlantic